

to distinguish, since they have distinctly characterized relations and attributions.

The determination of the homologous parts of the different ganglia has led to the recognition of a new arrangement equally curious and unexpected, which will, I hope, interest physiologists.

It is well known that in the neighbourhood of the external orifice of respiration there is to be found, at the extremity of a large pallial nerve, a ganglion of moderate size, to which one was tempted to give the name of *respiratory ganglion*, in consequence of the functions which its position caused to be ascribed to it. Now, by subjecting this ganglion to microscopic observation, both directly and after chemico-histological preparation (in a word, by analyzing it), we find that it is formed of an accumulation of nervous corpuscles, almost all unipolar, in the midst of which is immersed an actual cæcal process of the skin. This arrangement shows that here the outer limits of the body, by a sort of invagination, become approximated as closely as possible to a nervous centre and to the deep-seated elements characteristic of the centres.

Thus, from the study of the minute structure of the nervous centres of the aquatic pulmonate Gasteropoda we may deduce:—

1. That in these animals, as in higher creatures, there exist regions or lobes the histological constitution and the connexions of which establish for them distinct, special, and localized attributions.

2. That the nerves of special sensibility originate from the posterior part, whilst the nerves of motion have their origin upon the most anterior ganglion.

3. That we must recognize in the supposed respiratory ganglion not a nervous centre or true ganglion, but a new special organ produced by the invagination of the skin in the midst of a mass of ganglionic corpuscles.—*Comptes Rendus*, July 17, 1871, tome lxxiii. p. 161.

Further Observations on the Development of the Crayfish.

By S. CHANTRAN.

My recent experiments have confirmed the facts noted by me last year*, especially with regard to the period of the life of the young crayfish beneath the abdomen of the mother. I have observed that not only do they feed upon the pellicle of the eggs and on the carapace shed in their first moult, but the stronger ones eat those individuals whose development is rendered difficult by their agglomeration and which cannot moult. The facilitation of this moult is probably one of the causes of the mother constantly agitating her false legs during the two or three days preceding exclusion; to these the young crayfish are suspended. Those which, in moulting, break their limbs, are also devoured by their companions. Thus the crayfish, when they are ten days old, eat each other; and this is the case also

* See Ann. & Mag. N. H. ser. 4. vol. vi. p. 265.

with those of any age when they moult and are too numerous in a small space.

I have also observed that temperature exerts a marked influence upon the duration of the incubation of the eggs and upon the number of the periodical moults. The number of moults is eight in the first year following exclusion; it is five in the second year, or six in those years when the temperature is high; it is from two to three in the third year, which makes from fifteen to seventeen moults in all to the commencement of the fourth year. The male crayfish becomes adult (that is to say, ready for copulation) on entering upon his third year; and the female is ready for fecundation at the commencement of the fourth year.

All naturalists are aware that the organs of the crayfish are reproduced. According to my experiments the antennæ push out again during the time which separates one moult from the following one. The other limbs (such as the claws, the legs, the false legs, and the lamellæ of the tail) are regenerated more slowly, three moults taking place during their regeneration. When the fourth moult comes on, the regenerated limbs have acquired all their strength. In the first year of their existence, seventy days suffice for the regeneration of these limbs in the young crayfish. This is not the case with the adult crayfish: the female requires three or four years to reproduce its limbs, and the male from a year and a half to two years; for the adult male moults twice a year, and the adult female only once.

In an early note I will make known the results of experiments of this kind relating especially to the regeneration of the eyes.—*Comptes Rendus*, July 17, 1871, tome lxxiii. p. 220.

On Hypocotyledonary Gemmation. By Prof. ASA GRAY.

My attention has been called, by Mr. Guerineau, the gardener of the Cambridge Botanic Garden, to a remarkable instance which occurs in all our seedlings of *Delphinium nudicaule*, the unique red- or red-and-yellow-flowered species of California. As this species is now in European cultivation, and probably a variety of it, *D. cardinale*, was raised and figured in England several years ago, the peculiarity in question is likely to have been noted; but I have seen no account of it. In germination the slender radicle elevates a pair of well-formed ovate cotyledons in the usual way. These acquire full development; but no plumule appears between them; consequently the primary axis is here arrested. Soon a napiform thickening is formed underground at the junction of the lower end of the radicle with the true root: from this is produced a slender-petioled 3-lobed leaf, which comes up by the side of the primary plantlet; soon a second leaf appears, and so on, setting up the permanent axis of the plant from a bud which thus originates from the very base of a well-developed radicle, if not from the root itself.—*Silliman's American Journal*, July 1871.